新疆吉木乃地区始新世中期哺乳动物化石[1)]

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摘要 记述了新疆吉木乃地区托斯特西部发现的 *Triplopus* sp.、*Triplopus*? *jeminaiensis* sp. nov.、*Lophialetes* sp.及 Hyaenodontidae indet.等哺乳动物化石，证实了这一地区中始新世地层的存在。其属种构成大致可与内蒙古伊尔丁曼哈动物群及哈萨克斯坦中始新世 Obayla 或 Sargamys 哺乳动物群对比，时代为伊尔丁曼哈期。

关键词 新疆，吉木乃，始新世中期，哺乳动物

中图法分类号 Q915.87

1985 年 10 月，新疆地质局第一区域地质测量大队第十一分队在新疆吉木乃地区托斯特西部老第三纪地层中发现一批哺乳动物化石($850H_{11}$—X_{111}—12 化石点，47°29′ N, 85°88′ E)。1986 年 1 月该分队将其委托中国科学院古脊椎动物与古人类研究所童永生先生鉴定，1998 年 10 月，童永生先生嘱作者作进一步研究。

吉木乃位于新疆维吾尔自治区的西北部，额尔齐斯河流经吉木乃北面，在哈巴河县流出境外，汇入哈萨克斯坦共和国的斋桑湖。吉木乃地区的第三纪地层在我国的地层分区文献中，常被归入吉木乃—哈巴河—布尔津盆地，实际上应看作是斋桑盆地的东延部分。在 20 世纪 70 年代，前苏联的古生物学家曾在斋桑盆地西部(即哈萨克斯坦境内)做过大量工作，也发现不少第三纪哺乳动物化石。在我国境内部分虽做过探索，由于投入不够，发现甚少，尚待补缺。1982 年，中国科学院古脊椎动物与古人类研究所野外队曾在吉木乃地区找到零散的石炭兽类(anthracotheriids)牙齿[2)]，王运发(1984)也在额尔齐斯河北岸找到 *Hyaenodon* sp.。本文记述了三种奇蹄类化石及一肉齿类化石，虽材料不多，但确是该地区老第三纪哺乳类的首次记录，并为斋桑盆地东部地层的划分提供了古生物学依据。

文中描述奇蹄类牙齿的构造术语依 Hooker, 1989。

1 化石记述

奇蹄目 Perissodactyla Owen, 1848

犀超科 Rhinocerotoidea Gill, 1872

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2) 据1982年中国科学院古脊椎动物与古人类研究所新疆队的新疆准噶尔盆地北缘中、新生代地层调查报告。

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蹄齿犀科 Hyracodontidae Cope, 1879

三脊犀属 *Triplopus* Cope, 1880

三脊犀(未定种) *Triplopus* sp.

(图 1)

材料 1颗上臼齿,右 M1 或 M2(IVPP V 11827)和一段带有 m1 的跟座及完整 m2 的左下颌骨(IVPP V 11850)。

描述和比较 上臼齿稍有磨蚀,牙冠方形,低冠,横宽。外脊粗壮,前尖明显且稍向舌侧突出,前附尖发育,前尖肋及前附尖肋强,两肋之间的沟明显而直。外脊的后半部强烈向内倾斜,后端稍向外伸展。后脊比原脊高、短,更向舌后侧倾斜。前后齿缘发育,舌侧原脊和后脊之间仍有齿带发育(宽 22.2mm,长 19.6mm.)。

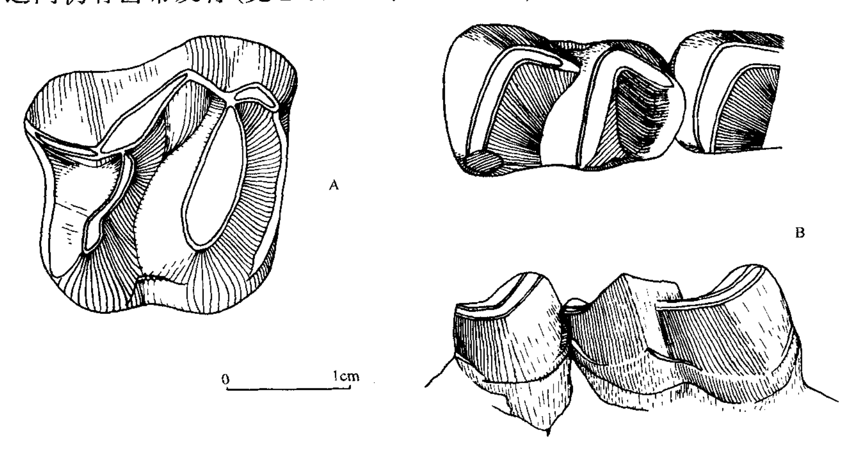


图1 三脊犀未定种A. M1或M2(V 11827); B. 存m1的跟座及m2的左下颌(V 11850)冠面视和颊面视

Fig.1 *Triplopus* sp. A. M1 or M2 (V 11827); B. occlusal and labial views of left lower jaw with m1～m2 (V 11850)

下臼齿为典型的犀形类下臼齿,牙齿较长,低冠。下原脊与下次脊较斜,彼此近于平行,三角座的外侧及前后齿缘发育(m1 跟座宽 12.0mm, m2 长 19.5mm,三角座宽 12.6mm,跟座宽 12.9mm)。

吉木乃标本的 M1 或 M2 在大小及形态特征上与蹄齿犀科已知属中的 *Prohyracodon* 及 *Triplopus* 较为接近。但 *Prohyracodon* 已知种的上臼齿相对窄长,齿长一般大于齿宽,且 *P. merientale* 前尖未向舌侧突出, *P. orientale* 及 *P. obrutschewi* 的上臼齿在舌侧无齿缘发育, *P. parvum* 上臼齿相对较小,易与吉木乃标本区别开。

Triplopus 属的已知种上臼齿一般横宽,与吉木乃标本的特征吻合。亚洲种 *T. proficiens* 的M2 与吉木乃标本在大小上较为接近,但有小刺,与吉木乃标本不同;北美种 *T. rhinocerinus*、亚洲种 *T. proficiens* 及 *T.? mergenensis* 的下臼齿在大小上与吉木乃标本较为接近,但 *T.? mergenensis* 下原脊几乎垂直于长轴, *T. rhinocerinus* 及 *T. proficiens* 的下臼齿相对较狭长,与吉木乃标本不同。在斋桑盆地西部发现的 *T. chkhikvadzei* (p2～m3)在大小上与吉木乃标本很接近,从 Gabunia(1984)的描述和图版上看,与后者的特征也较吻合,很可能是同一种,但 Gabunia 在描述中提到此种下臼齿的三角座比跟座稍宽,而吉木

乃标本中跟座稍比三角座宽或基本一致。这种差异是种内差异,还是不同种之间的差异,尚难确定。

吉木乃三脊犀? (新种) *Triplopus*? *jeminaiensis* sp. nov.

(图 2)

正模　左下颌骨,保存 p3~m1(IVPP V 11828)。

特征　个体小,低冠,p3、p4 臼齿化,下次脊几乎垂直于牙冠的长轴;m1 下次脊及下原脊均较斜,彼此近于平行。

描述和比较　个体小,m1 齿长约是上述 *Triplopus* sp.的下臼齿的一半,在大小上与北美的小型犀形动物 *Toxotherium* 相近。

p3 臼齿化程度较高,下次脊已形成,但明显比下原脊低,与齿冠的长轴近于垂直,斜脊与下次脊等高,从下次尖水平向下原脊延伸,在下原尖及下后尖之间部分与下原脊连接,高度约为下原脊的 1/2。下原脊斜向舌后侧,较高,下前脊长,但较弱,向舌侧延伸,倾斜度大,终止处几达齿冠的基部(长 9.15mm,宽 4.90mm)。

p4 臼齿化程度高,下次脊部分破损,低于下原脊,下前脊明显且长,平行于下原脊,斜脊较明显,与 p3 相似,水平延伸至下原脊,高度约为下原脊的 2/3,前后齿带较发育,下三角座稍比下跟座宽(长 9.50mm,宽 5.75mm)。

m1 的下次脊与下原脊等高,斜脊向下倾斜,在下原尖及下后尖部分与下原脊连接,连接处高度约为下原脊的 2/5,其他特征与 p4 相似(长 11.00mm,宽 7.15mm。)

吉木乃标本与脊齿貘科的一些种类在下臼齿的形态上有些相似,但脊齿貘科的前臼齿未臼齿化,具下次小尖,而吉木乃标本中的前臼齿不具下次小尖,p4 臼齿化,因此不能归入脊齿貘科。

Toxotherium 为犀超科中的一属,科未定。其吻区的牙齿(门齿或犬齿)较独特,齿虚位较短,p1 及 p2 退化(Emry, 1979)。吉木乃标本中只保存了 p3~m1,在齿冠的形态、齿带的发育情况及臼齿化程度等特征上与此属唯一的种 *T. hunteri* Wood, 1961 (= *T. woodi* Skinner and Gooris, 1966 = *Schizotheriodes jackwilsoni* Schiebout, 1977)较为接近,但北美种齿冠相对较高,下前臼齿,特别是 p4 的下次尖较为独立,下次脊斜(Wood, 1961)。吉木乃标本中 p3 之前部虽未被保存,但牙齿相对低冠,下次尖与下内尖连接形成较完整的脊,可以肯定不能归入此属。

吉木乃标本个体小、下前臼齿臼齿化、下臼齿为典型的犀型齿,与蹄齿犀科的吻合。蹄齿犀科中个体较小的有 *Triplopus*, *Prohyracodon*, *Epitriplopus* 等属。吉木乃标本 p3、p4 臼齿化程度高,下次脊较为完整,与 *Prohyracodon* 差别明显;*Epitriplopus* 个体较小,但此属齿冠相对较高。*Triplopus* 的齿冠较低,与吉木乃标本的特征吻合,而此属已知种中只有北美种 *T. cubitalis* 及 *T. implicatus* 在大小上与吉木乃标本较为接近,但此两种臼齿化程度明显不如吉木乃标本,且 *T. cubitalis* m1 的后齿带比吉木乃标本明显,前臼齿的下次尖相对较高,下原脊及下次脊近于平行;*T. implicatus* 下前臼齿及下臼齿的后齿带比吉木乃标本中明显,下前臼齿中下次尖相对较高。

综上所述,吉木乃标本无疑是个新种,有可能归入 *Triplopus* 属,但由于材料有限,以及在前臼齿的臼齿化程度等特征上的差异,对于是否确可归入此属尚有疑问,需要更多的材

料来进一步确定。

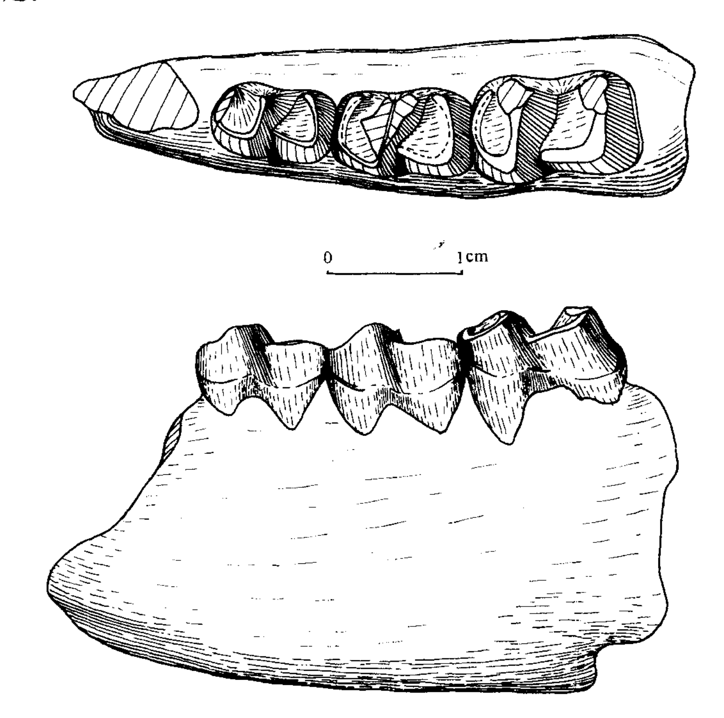


图2 吉木乃三脊犀？(新种)存p3～m1的左下颌(V 11828)冠面视和颊面视

Fig.2 *Triplopus*? *jeminaiensis* sp. nov, occlusal and labial views of left lower jaw with p3～m1 (V 11828)

脊齿貘科 Lophialetidae Radinsky, 1965

脊齿貘属 *Lophialetes* Matthew and Granger, 1925

脊齿貘(未定种) *Lophialetes* sp.

(图3)

材料 带有DP1齿槽及DP2～4的右上颌骨(IVPP V 11829)。

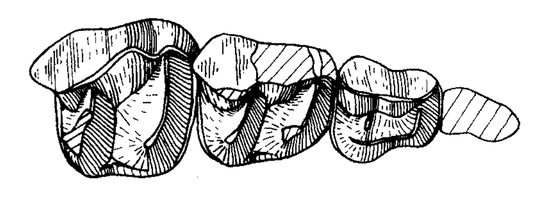


图3 *Lophialetes* sp. 右DP1(齿槽)～DP4 (V 11829),冠面观

Fig.3 *Lophialetes* sp. right DP1(alveolus)～DP4 (V 11829), occlusal view

描述和比较 牙齿低冠,DP2～4渐增大,磨蚀程度低。釉质层薄,从唇侧可观察到DP3的齿根分得很开。从齿槽可看出DP1是双根齿,齿槽前有齿缺。

DP2～DP4齿冠的前后均可观察到明显的齿带,DP3、DP4舌侧齿带发育,DP2相对较弱。DP2冠面梯形。外脊主要由前尖组成,前尖大而明显,向舌侧突出,前附尖及后尖弱,前尖肋较为明显。原脊较弱,与次尖连接,而次尖未与后脊连接。后脊也很弱。DP3冠面近方形,臼齿化程度高。后尖较长,原脊和后脊高而尖锐。牙齿最宽处在齿冠后部。DP4齿冠近方形,横宽,臼齿化程度高,显示出典型

的犀型齿特征，但齿脊高而尖锐。

根据标本中所保存的乳齿的特征来看，与 *Lophialetes expeditus* 种中伊尔丁曼哈标本(AMNH 26122)、马捷茨营地标本(IVPP V 5754)的 DP2～4 有很多相近的特征，但也有些不同之处，如：AMNH 26122 标本中 DP4 的内齿带不如吉木乃标本发育，DP2 臼齿化程度明显比后者高，且后者 DP2 齿冠的形态更趋于三角形；吉木乃标本 DP2 原脊较直，与后脊基本平行，向舌后侧延伸，与次尖连接，DP3 后尖肋只是稍有发育，V 5754 中前尖肋及后尖肋清楚。

表1 *Lophialetes* sp. 牙齿测量及与其他标本的比较

Table 1 Measurements of *Lophialetes* sp. and comparison with other specimens (mm)

		Lophialetes sp.	*Lophialetes expeditus* (Irdin Manha Beds) (Radinsky, 1965)	*Lophialetes expeditus* (Ulan Shireh Beds) (Radinsky, 1965)	*Lophialetes expeditus* (Camp Margetts) (Qi, 1987)
DP2	Length	9.7	7.3～9.0(8.01±0.12)	7.2～8.2(7.65±0.10)	7.8
	Width	10.6	7.3～8.9(8.19±0.11)	7.1～8.7(7.76±0.14)	7.3
DP3	Length	13.5	9.0～11.6(10.30±0.13)	8.5～10.3(9.25±0.14)	9.0
	Width	13.0	9.0～11.0(10.05±0.13)	8.6～9.8(9.06±0.11)	9.3
DP4	Length	14.9	11.0～12.2(11.64±0.16)	8.8～11.0(10.07±0.21)	9.6
	Width	16.1	11.3～12.5(12.03±0.20)	10.0～11.5(10.72±0.20)	10.4

从牙齿的大小上来看，吉木乃标本的 DP2～4 比 Irdin Manha、Ulan Shireh、Camp Margetts 产出的 *Lophialetes expeditus* 分别大 30%、35%～50%、40%～55% 左右(表 1)。*L.*? *primus*(程捷、马安成，1990)的正模为 m3 和破碎的 m2，不能直接对比，但此种与 *L. expeditus* 大小较为相近，所以与吉木乃标本的大小差异也较大。Radinsky(1965)将产自内蒙古 Chimney Butte 的编号为 AMNH 81687(p2～m3)、81690(dp4～m1)、81681(DP3～4, P3～M2)的标本定为 *Lophialetes* sp.，这些标本比同一层位(Ulan Shireh)中所产出的被指为 *L. expeditus* 的标本大 20%～25%，比 Irdin Manha 中所产出的化石大 12% 左右。本文中所描述的乳齿标本比这些未定种标本还大。产自沙拉木伦的 AMNH 26138 (p2～m2)不能直接与吉木乃标本对比，但根据 Radinsky(1965)的描述，此标本可能与上述未定种为同一种，或也有可能是伊尔丁曼哈 *L. expeditus* 的地理变种。Teilhard de Chardin(1930)描述的产自河南的 *Lophialetes* sp.为 M3，不能直接对比，但从大小上也明显比吉木乃标本小。可见，本文中所描述的标本与归入 *Lophialetes* 的已知种在大小和形态上都有较大差别，与前人所定的一些未定种在大小上也有较大出入，可能代表一新种。

肉齿目 Creodonta Cope, 1875

鬣齿兽科(属种未定)Hyaenodontidae gen. et sp. indet.

材料 一破碎的左下臼齿(IVPP V 11830)。

描述和比较 只保存了牙齿三角座的下前尖部分，下原尖、下后尖及跟座部分均未保存。下前尖较大，齿尖部分也已破损。依据牙齿特征及大小应属于肉齿目的鬣齿兽科，似与 *Pterodon* 的下臼齿较为接近，但标本保存过于破碎，不能进一步确定。

2 与相关动物群的关系及地质时代

新疆吉木乃地区托斯特西部老第三纪地层中发现的哺乳动物包括 Hyaenodontidae gen. et sp. indet.、*Lophialetes* sp.、*Triplopus* sp.及 *T.*? *jeminaiensis* 等，其中 *Triplopus* 属及 Hyaenodontidae 在准噶尔盆地北缘尚属首次发现。化石组合以奇蹄类占主导地位，其中包括 *Lophialetes*、*Triplopus* 等亚洲中始新世常见分子，因此可认为含化石地层的时代为中始新世。中始新世动物群组合中阿山头动物群和伊尔丁曼哈动物群以奇蹄类为主，常有 *Lophialetes* 的出现，而沙拉木伦期动物组合中奇蹄类所占比例已开始明显下降，所以吉木乃哺乳动物组合与阿山头期和伊尔丁曼哈期动物群更接近。吉木乃化石组合中产有 Hyaenodontidae，而鬣齿兽类化石在阿山头动物群组合中少见，伊尔丁曼哈期比较常见，在奇蹄类组合中缺少阿山头动物群常见的 *Schlosseria* 标本，故推测吉木乃化石组合的时代应为始新世中期的伊尔丁曼哈期(Irdinmanhan)，属种构成上与内蒙古的伊尔丁曼哈动物群较类似。

斋桑盆地的哈萨克斯坦部分早第三纪的沉积很发育(Gabunia，1977；Russell and Zhai，1987)。本世纪 70 年代，前苏联科学家在盆地西部做了大量的工作。Gabunia(1977)在报道斋桑盆地的老第三纪地层和哺乳动物时，将该地的始新统分为 6 层：Chakpaktas 和 Obayla 的时代为早始新世，Sargamys 和 Konurkura 为中始新世，Chaybulak 和 Kyzykain 为晚始新世，Aksyir 为早渐新世。Russell 和翟人杰(1987)在汇总亚洲老第三纪时对斋桑盆地的哺乳动物化石进行了总结，根据哺乳动物群的特点认为原属于下始新统的 Chakpaktas 和 Obayla 的时代应是中始新世，原属于渐新世的 Aksyir 的下部应是晚始新世，即中始新世包括 Chakpaktas、Obayla、Sargamys 和 Konurkura 等 4 个化石层或组(svita)。据最近的研究，原认为始新世晚期的沙拉木伦动物群应是中始新世晚期(童永生，1989；童永生等，1995)，与沙拉木伦期对比的 Chaybulak、Kyzykain 和 Aksyir 的下部的时代似乎也应认为是中始新世晚期。吉木乃和斋桑盆地西部中始新世动物种类都较少，标本也不很完整，两者对比是相当困难的。相比之下，吉木乃哺乳动物组合可能与 Obayla 哺乳动物组合最接近，也有可能与 Sargamys 组合相当。层位较低的 Chakpaktas 组哺乳动物组合中只有 *Triplopus* 属与吉木乃是共同分子，此组合中包括了 *Homogalax*，似乎时代较早，而吉木乃组合中的鬣齿兽的形态与 *Pterodon* 接近，可能时代不会太早。或许 Emry 和 Lucas(1999)是对的，Chakpaktas 动物群组合的时代接近 Arshanto 期；Obayla 组哺乳动物以奇蹄类为主，*Lophialetes*、*Triplopus* 和 Hyaenodontidae 均有出现，可与吉木乃哺乳动物组合对比；Sargamys 组中尚未发现 Hyaenodontidae，但 *Triplopus* 和 Lophialetidae 是共同的。Konurkura、Chaybulak 及 Kyzykain 组哺乳动物化石很少，也未正式报道，而层位较高的 Aksyir 下部动物群与吉木乃动物群无共同分子。因此，初步认为吉木乃哺乳动物组合大致可与 Obayla 动物组合对比，但也不排除与 Sargamys 哺乳动物组合相对应的可能性。

准噶尔盆地北缘的东部地区已有中始新世哺乳动物发现(周明镇，1958；童永生，1989；童永生等，1990)，其中的三个泉地区与吉木乃哺乳动物组合较类似，都以奇蹄类占主导地位，但两者没有共同分子，难以比较。

综上所述，吉木乃地区动物组合大致可与斋桑盆地西部的中始新世 Obayla 或 Sargamys 动物群及内蒙古伊尔丁曼哈动物群对比，时代可能是伊尔丁曼哈期。另外，在吉木乃县境内曾找到时代较晚的 *Hyaenodon* sp.（王运发，1984），在扎勒帕克一带找到石炭兽类（anthracotheriids）[1)]，说明这一地区可能有更晚期的地层存在。

新疆吉木乃地区在索索泉组红色堆积之下的 400～500 m 厚的浅色沉积物过去被称为“乌伦古河组”，其时代被认为是始新世—渐新世。新疆地质局第一区域地质测量大队在吉木乃地区的“乌伦古河组”发现 Hyaenodontidae gen. et sp. indet.、*Lophialetes* sp.、*Triplopus* sp.及 *T.*? *jeminaiensis* 等中始新世哺乳类化石，证明了吉木乃地区中始新世地层的存在。就目前所知的哺乳动物化石线索来看，吉木乃地区“乌伦古河组”包含始新世中期的层位，也不排除有更早和更晚期地层存在的可能性。“乌伦古河组”原建于准噶尔盆地北缘，其内涵已有变动，因此，将吉木乃地区的始新世地层称为“乌伦古河组”并不合适。

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MIDDLE EOCENE MAMMALS OF JEMINAY, XINJIANG

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Key words　Xinjiang, Jeminay, Middle Eocene, mammals

Summary

Triplopus sp., *Triplopus*? *jeminaiensis* sp. nov., *Lophialetes* sp. and Hyaenodontidae gen. et sp. indet. collected from the Early Tertiary of Jeminay ($850H_{11}$-X_{111}-12, 47° 29′ N, 85° 88 ′ E), Xinjiang by Geology Bureau of Xinjiang Uygur Autonomous Region in 1985 are described in this paper. These newly found fossils demonstrate the existence of Middle Eocene deposits in Jeminay area. And the mammal assemblage can be compared with Irdin Manha fauna of Nei Mongol, and approximately equivalent to Obayla svita or Sargamys svita of western Zaysan basin. Its age is considered as Irdin Manha period.

1) 中国科学院古脊椎动物与古人类研究所新疆队，1982. 新疆准噶尔盆地北缘中、新生代地层调查。

1 Systematic Paleontology

Order Perissodactyla Owen, 1848

Super Family Rhinocerotoidea Gill, 1872

Family Hyracodontidae Cope, 1879

Genus *Triplopus* Cope, 1880

***Triplopus* sp.**

(fig. 1)

Materials A right M2 or M1 (IVPP V 11827) and a left lower jaw with talonid of m1 and m2 (IVPP V 11850).

Description and comparison M2 or M1 low-crowned. Ectoloph robust, paracone and parastyle prominent. Metacone lingually situated, anterior and posterior cingula clear, lingual cingulum developed between protoloph and metaloph. Protocristid oblique, parallel to hypolophid, labial cingulid developed on trigonid.

The specimen is similar to *Triplopus* and *Prohyracodon* in its morphology and size. However, upper molars of *Prohyracodon* are relatively longer and narrower than Jeminay specimen.

M2 of *T. proficiens*, an Asian species of *Triplopus*, is most similar to Jeminay specimen but different from it in having a crista. Lower molars of *T. rhinocerinus*, *T. proficiens* and *T.? mergenensis* are similar to the specimen in size, but protocristid of *T.? mergenensis* is nearly perpendicular to the medium axis, *T. rhinocerinus* and *T. proficiens* relatively narrower and longer in morphology. *T. chkhikvadzei* (Gabunia, 1984) from Zaysan basin, Kazakhstan is similar to Jeminay specimen in size and lower molar morphology, but according to Gabunia's description, its trigonid is wider than talonid, whereas the talonid is wider than trigonid in Jeminay specimen.

***Triplopus*? *jeminaiensis* sp. nov.**

(fig. 2)

Type A left lower jaw with p3～m1 (IVPP V 11828).

Diagnosis Small hyracodontid with low-crowned teeth. p3～p4 molarized, hypolophid nearly perpendicular to the axis of the tooth; m1 hypolophid oblique, parallel to protocristid.

Description and comparison Small in size, about one-half smaller than *Triplopus* sp. described above. p3 molarized, hypolophid almost perpendicular to the longitudinal axis of the tooth and apparently lower than protocristid. Paralophid long and weak, parallel to protocristid. p4 molarized, paralophid long and prominent. Trigonid is a little wider than talonid. m1 hypolophid oblique, parallel to protocristid, cristid obliqua slopes down.

Toxotherium is similar to Jeminay specimen in size, but *Toxotherium* is

high-crowned (Emry, 1979), and hypoconid on premolars isolated, especially on p4 (Wood, 1961).

Jeminay specimen is referred to Hyracodontidae by small size, rhinocerotoid-type lower teeth and molarized premolars. Some hyracodontids such as *Triplopus*, *Epitriplopus*, *Prohyracodon* are relatively small in size. However, *Prohyracodon* has incomplete hypolophid on lower premolars, *Epitriplopus* has relatively high crown. The Jeminay specimen is close to *Tripolopus* in dental morphology. Among *Triplopus*, only *T. cubitalis* and *T. implicatus* are similar to Jeminay specimen in size, but can be distinguished from it by more prominent postcingulid on m1 and relatively high hypoconid on premolars, on the other hand, lower premolars of Jeminay specimen is more molarized than these two species.

In sum, Jeminay specimen undoubtedly represents a new species of Hyracodontidae, possibly of *Triplopus*.

Super Family Tapiroidea

Family Lophialetidae Radinsky, 1965

Genus *Lophialetes* Matthew and Granger, 1925

***Lophialetes* sp.**

(fig. 3)

Material A right upper jaw with alveolus of DP1 and DP2～4 (IVPP V 11829).

Description and comparison Lightly built tapiroids with post-canine diastema. Cingula developed on DP2～DP4, relatively weak at the labial side. DP2 is submolariform, trapezoidal in shape, ectoloph mainly consists of paracone, protoloph connected with hypocone which is separated from weak metaloph. DP3 fully molarized, metacone rib developed, protoloph and metaloph high and acute, parallel to each other. DP4 with a prominent parastyle, paracone is the most prominent and biggest cusp of ectoloph, paracone rib and parastyle rib strong.

Jeminay specimen is similar to those of *Lophialetes expeditus* collected from Irdin Manha beds (AMNH 26122) and Camp Margetts (IVPP V 5754). However, DP2 of AMNH 26122 is fully molarized, lingual cingulum on DP4 is less developed; paracone rib and metacone rib on DP3 of V 5754 are relatively more prominent than those of Jeminay specimen.

In addition, DP2～DP4 of the specimen is about 30%, 35%～50% and 40%～55% larger than that of *Lophialetes expeditus* from Irdin Manha beds, Ulan Shireh beds and Camp Margetts. Holotype (m3 and broken m2) of *L.*? *primus* (Cheng and Ma, 1990) can not be compared to Jeminay specimen directly, but can be distinguished from it by much larger size. Radinsky (1965) described AMNH 81687 (p2～m3), 81690 (dp4～m1) and 81681 (DP3～4, P3～M2) collected from Chimney Butte, Nei Mongol as *Lophialetes* sp., which is about 20%～25% larger than the

fossils collected from the same beds (Ulan Shireh), and 12% larger than the fossils of Irdin Manha. The specimen from Jeminay is much larger than these specimen, and can also be distinguished from *Lophialetes* sp. from Sharamulun (AMNH 26138 (p2～m2)) (Radinsky, 1965) and Henan (M3) (Teilhard de Chardin, 1930) by its much larger size, and it probably represents a new species.

Order Creodonta Cope, 1875

Hyaenodontidae gen. et sp. indet.

Material An incomplete lower molar (IVPP V 11830).

Description and comparison Only part of paraconid is preserved. It maybe referred to genus *Pterodon*, but under the limitation of the specimen, the present identification can only be tentative pending further discovery.

2 The relationships with some related faunas and the age of the Jeminay fauna

Early Tertiary mammals collected from Jeminay, Xinjiang, include Hyaenodontidae gen. et sp. indet., *Lophialetes* sp., *Triplopus*? *jeminaiensis* sp. nov., and *Triplopus* sp. Among them, *Triplopus* and Hyaenodontidae are first reported in this area. *Lophialetes* and *Triplopus* are typical and dominant perissodactyls in the Middle Eocene faunas of central Asia. The occurrence of these two genera indicates the existence of Middle Eocene deposit in Jeminay area. Among middle Eocene faunas, Arshanto and Irdin Manha faunas are dominated by perissodactyls, and *Lophialetes* usually occurs in both faunas. However, Hyaenodontidae, a specimen of Jeminay, seldom appears in Arshanto fauna, so I consider the Jeminay fauna more similar to Irdin Manha fauna, and the age should be Irdinmanhan.

The continental Paleogene sediments are remarkably complete in the Zaysan Basin of eastern Kazakhstan (Gabunia, 1977; Russell and Zhai, 1987). In 1970s, the paleontologist of pre-USSR did a lot of work in the western part of the basin. Gabunia (1977) divided the Eocene sediments of the area into 6 svitas: Chakpaktas and Obayla (early Eocene), Sargamys and Konurkura (middle Eocene), Chaybulak and Kyzykain (late Eocene). Russell and Zhai (1987) considered the age of Chakpaktas and Obayla svitas as middle Eocene, according to the mammal assemblage of the western Zaysan basin. On the basis of recent study, the age of Shara Murun fauna, which was considered as late Eocene previously, must be middle Eocene (Tong, 1989; Tong, *et al.* 1995), therefore, the age of Konurkura, Chaybulak, and lower Aksyir svitas is middle Eocene.

Because of the limitation of the materials from Jeminay and western Zaysan basin, the comparison can only be tentative, and as a result of comparison, Jeminay fauna seems most similar to Obayla fauna, or equivalent to Sargamys fauna. In Chakpaktas

fauna, only *Triplopus* is common to Jeminay fauna, and *Homogalax* occurs in Chakpaktas fauna, so I consider Jeminay fauna is younger than Chakpaktas fauna in age. Similar to Jeminay fauna, perissodactyls dominate Obayla fauna, and *Lophialetes*, *Triplopus* and Hyaenodontidae occur in Obayla fauna. *Triplopus* and Lophialetidae are common both in Sargamys and Jeminay fauna, but Hyaenodontidae does not appear in Sargamys. No mammal fossils have been reported from Konurkura, Chaybulak and Kyzykain svita. Lower Aksyir fauna has no genus common to Jeminay fauna. Therefore, Jeminay assemblage is approximately similar to Obayla fauna, or equivalent to lower Sargamys fauna.

Huashigou fauna, 100 km south of Ulungur River, is also dominated by perisso-dactyls, but has no genus common to Jeminay fauna.

In sum, Jeminay fauna can be compared with Obayla or Sargamys fauna of Kazakhstan and Irdin Manha fauna of Nei Mongol, and its age is considered as Irdin Manha mammalian age. In addition, the appearance of *Hyaenodon* (Wang, 1984) and some anthracotheriids[1] in the same area indicates there might be younger deposits in Jeminay area.

The age of the Ulungur Formation of Jeminay area used to be considered as Eocene–Oligocene. The middle Eocene mammals collected from "Ulungur Fomation" of Jeminay provides the paleontological evidence to demonstrate that the "Ulungur Formation" of Jeminay area includes middle Eocene deposit, in the same time, the possibility of the existence of younger deposits can not be excluded.

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50

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